British Journal of Psychology (2010), 101, 95–107


The British Psychological Society

www.bpsjournals.co.uk

# Is learning mindfulness associated with improved affect after mindfulness-based cognitive therapy?

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The increased popularity of mindfulness-based interventions and the growing body of empirical evidence confirming the positive effects of these interventions on well-being warrant more research to determine if the effects are indeed related to learning mindfulness. The present study extends previous studies, by examining whether and how changes in five core aspects of mindfulness are related to changes in the report of negative and positive affect during an 8-week course of mindfulness-based cognitive therapy. The study was performed in 64 individuals from the community with mild to moderate psychological problems. Data were collected by self-report questionnaires before and directly after the training. Results showed significant decreases in negative affect and increases in positive affect. We also found significant increases in four of the five aspects of mindfulness. Importantly, changes in mindfulness were significantly associated with improved affect, with a distinct pattern found for positive and negative affect. Hereby, our findings extend previous research by showing that learning distinct aspects of mindfulness is differently related to an improved positive affect and a decreased negative affect. Future randomized controlled trials with a larger sample and longer follow-up period are needed to replicate these findings.

Mood disorders are important public health problems due to their relative high prevalence and significant disability that they may cause. Therefore, the potential gains of an early intervention may be considerable, as it may prevent mild symptoms becoming more severe and/or long lasting. The present study examined the effects of a mindfulness-based intervention on psychological well-being in a community sample. The aim of the present study is to go beyond the examination of changes in psychological well-being over the course of the intervention, by also addressing the role of mindfulness in the report of such an improved well-being. Specifically, we examined the extent to which participants actually learn different mindfulness skills and whether

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DOI:10.1348/000712609X424195

the enhancement of these skills is related to an improved affect. As far as we know, this is one of the first studies on this topic that distinguish distinct core mindfulness skills. As such, we hope to enhance our understanding of the role of mindfulness in psychological well-being and the mechanisms underlying mindfulness-based interventions.

*Mindfulness* originates in Eastern Buddhist meditation traditions (Baer, Smith, & Allen, 2004) and refers to being aware of and intentionally attending to ongoing experiences (Brown & Ryan, 2003; Kabat-Zinn, 2003). Such a present-moment awareness is believed to enhance affective balance and psychological well-being, by preventing habitual reacting and encouraging a more adaptive deliberate response to experiences (Baer *et al.*, 2004; Segal, Williams, & Teasdale, 2002). Indeed, higher levels of mindfulness have been related to more positive affect, life satisfaction, self-esteem, and optimism and less negative affect and rumination (Brown & Ryan, 2003).

Mindfulness is believed to be a skill that can be learned and developed through meditation practice. As such, it has been practiced for more than 2,500 years. In 1979, Kabat-Zinn (1990) introduced a structured 8-week group training to cultivate mindfulness, *mindfulness-based stress reduction* (MBSR; Kabat-Zinn, 1990). The focus is on doing exercises, such as the body scan, yoga, sitting, and walking meditation. More recently, Segal and colleagues combined MBSR with cognitive therapy, so-called *mindfulness-based cognitive therapy* (MBCT; Segal *et al.*, 2002). Learning to (early) recognize and attend to distressing thoughts and emotions and to disengage from automatic dysfunctional thoughts and behavioural patterns (such as rumination and avoidance) are believed to be a core aspect of MBCT. In recent years, these mindfulness-based interventions have become increasingly popular psychological interventions and most research on mindfulness is focusing on the effects of these interventions on health outcomes (Coelho, Canter, & Ernst, 2007). The findings are encouraging, showing that mindfulness-based interventions are effective in improving the physical and psychological well-being in individuals with a diverse range of conditions (Allen, Blashki, & Gullone, 2006; Baer, 2003; Grossman, Niemann, Schmidt, & Walach, 2004; Shigaki, Glass, & Schopp, 2006; Smith, Richardson, Hoffman, & Pilkington, 2006).

Remarkably, relatively little is known about *how* the intervention works. An important question that can be raised is whether mindfulness-based interventions indeed enhance mindfulness and whether such changes in mindfulness are related to positive outcomes. So far, only a few studies have examined this important topic. The results showed that participants do acquire mindfulness and that a greater ability to be mindful is related to decreases in mood disturbance and improvements in well-being (Brown & Ryan, 2003; Carmody & Baer, 2008; Chang *et al.*, 2004; Kumar, Feldman, & Hayes, 2008). Unfortunately, these studies regarded mindfulness as a unifactorial construct or combined different core aspects into one global indicator of mindfulness. Hereby, they overlooked the currently held notion that mindfulness may best be regarded and examined as a multidimensional construct (Baer *et al.*, 2004; Cardaciotto, Herbert, Forman, Moitra, & Farrow, 2008; Shapiro, Carlson, Astin, & Freedman, 2006). Based on meetings with leading experts in the field to come to a consensus and testable definition of mindfulness, Bishop *et al.* (2004) proposed a two-component model of mindfulness: (1) *attention regulation* and (2) a *non-judgmental attitude of acceptance*. The first component entails the observing and attending to the changing field of current thoughts, emotions, and sensations. Rather than suppressing or avoiding experiences or elaborating and getting caught up in their *content*, mindfulness involves the process of merely observing these experiences as temporary events in the mind, in a non-identified detached way (Bishop *et al.*, 2004; Segal *et al.*, 2002). The second component refers to

adopting a non-judgmental attitude towards pleasant and unpleasant experiences, characterized by curiosity, openness, and acceptance. The next step is to test the model for its validity and usefulness in clinical research. It is believed that distinct aspects of mindfulness are differentially related to psychological well-being (Baer *et al.*, 2008). Yet this idea has not been carefully examined in research on the effects of mindfulness-based interventions.

In order to fill the gap and extend previous research findings, the aim of the present study was twofold: (1) examination of changes in mindfulness and psychological well-being over the course of an 8-week MBCT training and (2) examination of the relationship between changes in mindfulness and changes in psychological well-being. With respect to the definition and assessment of mindfulness, we used the two-component definition as a conceptual model. In the present study, we specified three aspects related to the self-regulation of attention: (1) awareness in daily experiences and activities (rather than functioning on 'automatic pilot'), (2) awareness in observing and attending to bodily sensations, thoughts, and emotions, and (3) ability to 'step back' from the content of *unpleasant* experiences (rather than being over-identified). In addition, we specified two aspects of the particular orientation towards experiences: (1) a non-judgmental attitude of acceptance towards experiences, feelings, and thoughts and (2) an attitude of openness and curiosity towards *unpleasant* experiences. Regarding psychological well-being, we distinguished positive and negative affect, as research indicates that these two affective states are conceptually different and relatively independent of each other (Schroevers, Sanderman, van Sonderen, & Ranchor, 2000; Watson & Clark, 1997). We hypothesized that participants report an improvement in affect as well as an increase in all five mindfulness skills as they are core elements of the training. We also expected increases in mindfulness to be related to improved affect. Based on previous research (Baer *et al.*, 2008), we expected that especially awareness in daily activities and a non-judgemental accepting attitude would be strongly related to decreased negative affect and increased positive affect.

## Method

### *Participants*

For this study, we approached all general community adults who had signed in for an 8-week course of MBCT through a web page for mindfulness-based interventions. All participants were invited to take part in the study, with no exclusion criteria. In total, 129 participants were approached for involvement in the study, with only four persons dropping out of the intervention. In total, 85 participants filled out the pre-intervention questionnaire (of which one person dropped out of the intervention after one session). The post-intervention questionnaire was completed by 64 (75% of 85) participants.

The majority of the 64 participants was female (72%), mean age 43.23 years ($SD = 8.93$, range 23–63 years). Most participants had a partner (70%) and were higher educated, with 81% having finished a degree of college or university. About half of the participants (53%) reported a prior history of depression or anxiety, with 27% currently using medication for mood disorders. Using ANOVA and chi-squared analyses, we examined possible differences in demographic and clinical characteristics between the 64 individuals joining this study and the 21 individuals who dropped out after the pre-intervention assessment. We found no significant differences in gender, age, marital status, education, prior history of depression or anxiety, and current use of

medication for mood problems, neither in pre-intervention level of affect and mindfulness ($p > .05$).

### *Procedure*

All participants from 12 consecutive training courses, which ran over a half-year period, were approached for the study. Participation in the training programme was on a self-pay basis. Main reasons for participation were learning to ruminate less, to cope better with stress, to function less on 'automatic pilot' and be more aware of the present moment, and to have more moments of calmness and joy. Two weeks before the start of the course, the trainer sent participants an informational letter, an informed consent, and self-report questionnaire. Those willing to participate could send the informed consent and filled-in questionnaire by post to the main researcher. Within 1 week after finishing the course, participants were sent the post-intervention questionnaire.

### *Intervention*

The intervention was based on the structured protocol for MBCT, adapted for stress reduction by the Center for mindfulness research and practice, University of Wales, Bangor (Segal *et al.*, 2002). The courses were delivered in a private practice by two experienced clinical psychologists, who both had extensive 2-year training in mindfulness-based intervention as well as several years of personal mindfulness practice. The intervention consisted of 8-weekly 2.5 h sessions and a 6 h silence day that took place between week 6 and 7. All participants had an individual interview before the start of the course to assess suitability and to prepare them for the course. Each group had up to 12 participants. In the meetings, the focus was on the practice of formal exercises and the exchange of experiences and inquiry by the trainer. Participation in such group discussions was voluntarily. In addition, several exercises were done to increase awareness of (early) signs of stress, automatic stress reactions, negative thinking patterns, and ways of taking care of oneself. Participants were given a workbook containing information pertinent to each week's instruction and CD's with guided mindfulness exercises.

Participants were asked to daily practice at home for 45 min. In addition to these formal exercises, participants were asked to do a number of informal exercises, such as eating a meal with full awareness. At the post-intervention assessment, we asked participants to report their formal practice during the 8-week course. Only 6% of the participants reported to have practiced 1 or 2 times per week, 42% 3–4 times per week, 42% 5–6 times per week, and 10% 7 times per week (average 4.5 times per week). Regarding the length of a typical exercise, 17% reported 20 min or less, 30% 21–30 min, 48% 31–45 min, and 5% > 45 min (average 35 min).

### *Measures*

#### *Demographics*

At pre-intervention, we examined participants' characteristics: gender, age, education level, marital status, history of depression or anxiety, and current use of medication for mood disorder.

*Psychological well-being*

The positive and negative affect schedule (PANAS) was used to measure positive and negative affect (Watson, Clark, & Tellegen, 1988). Positive affect refers to the extent to which a person feels enthusiastic and active; negative affect reflects negative mood including anger, sadness, and nervousness. Both scales consist of 10 items. Patients were asked to rate the extent to which they had experienced each mood during the past 2 weeks, on five-point Likert scale (1–5). Higher scores reflect higher positive or negative affect. The scales have been found to be internally consistent and to have good validity. We found $\alpha$ coefficients of .88 for positive affect and negative affect.

*Mindfulness*

By the time of the study, no measure was available assessing all aspects of mindfulness of interest. Therefore, we used three validated questionnaires: the commonly used *mindful attention awareness scale* (MAAS; Brown & Ryan, 2003), two subscales of the widely used *Kentucky inventory of mindfulness skills* (KIMS; Baer *et al.*, 2004) and two subscales of *self-compassion scale* (SCS; Neff, 2003), which focus explicitly on mindfulness in the context of unpleasant experiences.

The 15-item MAAS (Brown & Ryan, 2003; Schroevers, Nyklícek, & Topman, 2008) measures the extent to which an individual is attentive to and aware of daily experiences and activities. Using a six-point Likert-type scale (1–6), respondents rate how often they have experiences of acting on automatic pilot (e.g. 'It seems I'm running on automatic, without much awareness of what I'm doing'). The 15 items yield a total score, with higher scores referring to greater mindfulness. Adequate reliability and convergent validity has been demonstrated (Brown & Ryan, 2003). We found an alpha coefficient of .84.

The 12-item subscale 'observing' of the KIMS (Baer *et al.*, 2004) measures the extent to which an individual is able to observe and attend to bodily or sensory sensations, thoughts, and emotions (e.g. 'I pay attention to sensations, such as the wind in my hair or sun on my face'). The 9-item subscale 'accept without judgment' assesses the extent to which an individual is able to hold a non-judging accepting attitude towards experiences (e.g. 'I tell myself that I shouldn't be feeling the way I'm feeling'). Items are rated on a five-point Likert-type scale (1–5). Higher scores on both subscales refer to more mindfulness. Research supports the internal consistency and validity of the scale (Baer *et al.*, 2004). We found an alpha coefficient of .79 for 'observing' and .92 for 'accept without judgment'.

The 4-item subscale 'mindfulness' of the SCS (Neff, 2003) measures the extent to which an individual is having an attitude of curiosity and openness towards *unpleasant* experiences (e.g. 'When I'm feeling down I try to approach my feelings with curiosity and openness'). The four-item subscale 'over-identification' assesses disengaging from the content of *unpleasant* experiences. (e.g. 'When something upsets me, I get carried away with my feelings'). Items are rated on a five-point Likert-type scale (1–5). Higher scores on both subscales refer to more mindfulness. Good internal consistency and validity of the scale has been demonstrated (Neff, 2003). We found an alpha coefficient of .88 for 'mindfulness' and .84 for 'overidentification'.

Examination of the correlations between the five mindfulness measures at pre-intervention showed significant moderate associations of MAAS with KIMS observing ($r = .48, p < .001$), KIMS accept without judgment ($r = .36, p < .01$), SCS mindfulness ($r = .44, p < .001$), and SCS overidentification ($r = .24, p = .06$); between KIMS accept

without judgment and SCS overidentification ($r = .59$, $p < .001$); between KIMS observing and SCS mindfulness ($r = .32$, $p < .01$). This suggests that these aspects represent related yet distinct skills. Interestingly, other aspects were non-significantly, weakly positively related to each other.

### *Statistical analyses*

First, we screened the distribution of the data. All affect and mindfulness scores were normally distributed, except for negative affect at post-intervention. This appeared to be due to one outlier. Analyses were conducted including and excluding this one outlier. As both methods yielded similar results, the analyses including all 64 participants are reported. Paired *t* tests were performed to examine changes in mindfulness and changes in psychological well-being ($p < .05$). Correlation and regression analyses were used to examine whether changes in mindfulness were related to changes in psychological well-being ($p < .05$). First, we calculated change scores (i.e. difference score = T2 − T1 scores). Next, change scores in mindfulness were correlated to change scores in positive and negative affect (two tailed). Finally, we performed regression analyses, with the change score of affect as the dependent variable and change score of mindfulness as independent variable. These analyses were controlled for pre-intervention levels of affect and mindfulness; hereby, we take into account that pre-intervention values are generally negatively correlated with change, because participants with low pre-intervention scores generally improve more than those with high scores. Indeed, we found that lower pre-intervention scores of positive affect were associated with a greater increase in positive affect ($r = -.51, p < .001$) and higher pre-intervention scores of negative affect were associated with a greater reduction in negative affect ($r = -.67$, $p < .001$). Similarly, lower pre-intervention levels of mindfulness were related to greater increases in mindfulness (ranging from $r = -.37$, $p < .01$ for being aware of daily experiences and activities to $r = -.56$, $p < .001$ for observing and attending to experiences).

We also examined whether we should control for confounding demographic factors. Independent *t* tests showed no significant differences in our outcome variable, i.e. changes in positive and negative affect, between men and women, low or high education, with or without a partner, yes or no history of depression or anxiety, or current use of medication ($p > .05$). Correlation analyses showed that age was not significantly related to changes in positive and negative affect ($p > .05$). Therefore, these factors were not included as covariates in the analyses.

Due to the size of the sample, we could not examine all facets of mindfulness simultaneously in the regression analyses. Therefore, separate regression analyses were performed for each facet of mindfulness. In *Step 1*, pre-intervention levels of mindfulness and affect (positive or negative) were entered; in *Step 2*, the change score of that facet of mindfulness was entered.

## Results

### *Changes in psychological well-being*

Table 1 shows the pre- and post-intervention group means and *SD* on affect and mindfulness. Paired *t* tests showed a significant increase in positive affect and a significant reduction of negative affect over time ($p < .001$). Effect sizes for paired *t* tests

**Table 1.** Means (and *SD*s) of psychological well-being and mindfulness at pre- and post-intervention

| | Pre-intervention | Post-intervention | *t* value | Effect size *d* |
|---|---|---|---|---|
| Psychological well-being | | | | |
| Positive affect | 26.75 (6.12) | 29.61 (5.68) | −4.31*** | 0.54 |
| Negative affect | 22.49 (7.92) | 18.36 (6.03) | 4.86*** | 0.61 |
| Mindfulness | | | | |
| Being aware of daily experiences and activities (MAAS) | 50.04 (9.96) | 56.36 (10.64) | −5.70*** | 0.71 |
| Observing and attending to experiences (KIMS) | 37.83 (6.48) | 41.51 (5.68) | −5.37*** | 0.68 |
| Disengaging from unpleasant experiences (SCS) | 13.22 (3.96) | 14.28 (3.35) | −3.80*** | 0.54 |
| Accepting without judgment (KIMS) | 26.47 (7.67) | 30.02 (7.05) | −5.44*** | 0.68 |
| Being open and curious towards unpleasant experiences (SCS) | 11.21 (3.19) | 11.59 (2.87) | −1.22 | 0.15 |

***$p < .001$.

(Cohen's $d$) were medium. Compared to normative data from a large non-clinical general population sample (Crawford & Henry, 2004), participants reported lower positive affect and higher negative affect at pre-intervention. After the training, their level of negative affect was more similar but still slightly higher than in the general population, while the level of positive affect was still slightly lower.

### *Changes in mindfulness*

Four of the five aspects of mindfulness significantly improved over time ($p < .001$). Only the skill of being open and curious towards unpleasant experiences did not change significantly. Effect sizes were moderate. Compared to norms from the general population, participants' level of being aware of daily experiences and activities was lower at pre-intervention, but rather similar at post-intervention (Brown & Ryan, 2003). Pre-intervention level of observing was similar to-levels in college students, with post-intervention level being higher than in students (Baer *et al.*, 2004). At pre-intervention, level of accepting without judgment was lower than in college students, but rather similar at post-intervention. Pre-intervention level of disengaging from unpleasant experiences was similar to those found in college samples and somewhat higher at post-intervention (Neff, 2003). In contrast, level of openness and curiosity towards unpleasant experiences remained rather low throughout the training, compared to college students.

### *Correlation and regression analyses*

Table 2 shows the correlations (two tailed) between changes in mindfulness and changes in positive and negative affect over the course of the intervention. Regarding the interrelations among changes in the five different aspects of mindfulness, results showed that an increase in being aware of daily experiences and activities was associated with changes in other aspects of mindfulness, particularly with an increase in observing and attending to experiences.

**Table 2.** Correlations between changes in mindfulness and changes in affect

| | 1 | 2 | 3 | 4 | 5 | 6 |
|---|---|---|---|---|---|---|
| 1. Δ Being aware of daily activities | – | | | | | |
| 2. Δ Observing and attending | .62*** | – | | | | |
| 3. Δ Disengaging | .25* | .15 | – | | | |
| 4. Δ Accepting without judgment | .28* | .18 | .17 | – | | |
| 5. Δ Being open and curious | .22# | .06 | .22# | .03 | – | |
| 6. Δ Positive affect | .27* | .27* | −.04 | .09 | .13 | – |
| 7. Δ Negative affect | −.04 | .04 | −.14 | −.27* | −.26* | −.01 |

*$p < .05$; ***$p < .001$; # $.05 < p < .10$.

A better attention regulation, as indicated by increases in being aware of daily experiences and activities and in observing and attending to experiences, was significantly related to an increased positive affect. A different attitude towards experiences, in terms of more accepting and being more open and curious towards unpleasant experiences, was significantly related to a reduced negative affect. Changes in disengaging were not significantly related to changes in affect.

When pre-intervention levels of affect and mindfulness were controlled for in regression analyses, the associations of changes in mindfulness with changes in positive and negative affect remained significant (Table 3). The same picture emerged, with improved attention regulation (i.e. being more aware of daily activities and in observing and attending to experiences) significantly related to increased positive affect and a different attitude (i.e. more accepting without judgment and being more open and curious towards unpleasant experiences) significantly related to decreased negative affect. In addition, a trend was found, showing that increases in being able to disengage from unpleasant experiences was related to a reduction in negative affect ($p = .07$).

## Discussion

As most research on mindfulness focuses on the effects of mindfulness-based interventions on psychological well-being, little is known about *how* the intervention works. One crucial question concerns whether participants indeed learn to be more mindful over the course of the intervention. In the present study, we examined whether and how changes in mindfulness are associated with improved affect. What is innovative about this study is that we examined the contribution of five distinct aspects of mindfulness to the report of both positive and negative affect. As hypothesized, we found significant improvements in positive and negative affect as well as in four of the five mindfulness skills. Importantly, correlation and regression analyses showed that changes in mindfulness were significantly related to changes in affect. Different aspects were significantly associated with improved well-being, with a distinct pattern found for positive and negative affect.

Our results add to the growing body of evidence indicating that mindfulness-based interventions are associated with improved psychological well-being (Allen *et al.*, 2006; Carlson & Garland, 2005; Carmody & Baer, 2008; Grossman *et al.*, 2004; Nyklícek & Kuijpers, 2008; Ott, Norris, & Bauer-Wu, 2006). Specifically, our present findings indicated that participants not only reported a decrease in negative affect but also an

**Table 3.** Regression analyses with changes in positive and negative affect as dependent variables and changes in mindfulness as independent variables

| | Changes in positive affect | | Changes in negative affect | |
|---|---|---|---|---|
| Mindfulness | β | $\Delta R^2$ | *B* | $\Delta R^2$ |
| *Being aware of daily experiences and activities* | | | | |
| Step 1 | | | | |
| Pre-intervention affect | −0.64*** | | −0.75*** | |
| Pre-intervention being aware | 0.40** | .33*** | −0.17 | .46*** |
| Step 2 | | | | |
| Changes in being aware | 0.31** | .08** | −0.15 | .02 |
| Total model $R^2$ | 41% ($F$ (3,60) = 13.98***) | | 48% ($F$ (3,60) = 18.54***) | |
| *Observing and attending to experiences* | | | | |
| Step 1 | | | | |
| Pre-intervention affect | −0.52*** | | −0.64*** | |
| Pre-intervention observing | 0.20 | .27*** | 0.19 | .47*** |
| Step 2 | | | | |
| Changes in observing | 0.26* | .05* | 0.09 | .01 |
| Total model $R^2$ | 31% ($F$ (3,59) = 8.97***) | | 48% ($F$ (3,59) = 17.95***) | |
| *Disengaging from unpleasant experiences* | | | | |
| Step 1 | | | | |
| Pre-intervention affect | −0.59*** | | −0.81*** | |
| Pre-intervention disengaging | 0.23# | .32*** | −0.35** | .49*** |
| Step 2 | | | | |
| Changes in disengaging | −0.01 | .00 | −0.20# | .03# |
| Total model $R^2$ | 32% ($F$ (3,60) = 9.19***) | | 52% ($F$ (3,60) = 21.88***) | |
| *Accepting without judgment* | | | | |
| Step 1 | | | | |
| Pre-intervention affect | −0.58*** | | −0.82*** | |
| Pre-intervention accepting | 0.39** | .34*** | −0.38** | .49*** |
| Step 2 | | | | |
| Changes in accepting | 0.22# | .04# | −0.33** | .09** |
| Total model $R^2$ | 38% ($F$ (3,59) = 12.16***) | | 57% ($F$ (3,59) = 26.26***) | |
| *Being open and curious towards unpleasant experiences* | | | | |
| Step 1 | | | | |
| Pre-intervention affect | −0.56*** | | −0.68*** | |
| Pre-intervention being open | 0.15 | .27*** | −0.11 | .46*** |
| Step 2 | | | | |
| Changes in being open | 0.14 | .01 | −0.27* | .05* |
| Total model $R^2$ | 28% ($F$ (3,60) = 7.83***) | | 51% ($F$ (3,60) = 20.87***) | |

*$p < .05$; **$p < .01$; ***$p < .001$; # $.05 < p < .10$.

increase in positive affect. Both from a theoretical and clinical perspective, this is of interest, as these affective states have proven to be relatively independent, with a reduction in depressed and anxious symptoms not automatically translating into feeling interested, enthusiastic, and excited (Watson & Clark, 1997). Further evidence that mindfulness-based interventions are effective comes from our finding that participants' psychological well-being at the start of the intervention was lower than in the general population, whereas after the intervention, their functioning was somewhat similar.

Overall, our findings call for more controlled clinical trials evaluating the effectiveness of mindfulness-based interventions in a larger sample and with a longer follow-up.

After the intervention, participants reported an increased awareness of daily activities, a better observation of and attendance to experiences, and a more accepting attitude towards experiences. Our findings confirm the results of two recent studies on changes in mindfulness over the course of an intervention and suggest that mindfulness is indeed a skill that can be learned (Carmody & Baer, 2008; Nyklícek & Kuijpers, 2008). The present study is the first to show that participants were also better able to disengage from unpleasant experiences. Unexpectedly, the skill of being open and curious towards unpleasant experiences, a core aspect during the MBCT intervention, did not change significantly over time. One possible explanation for this finding may be that our post-intervention assessment was too soon. It might take a longer time than 8 weeks to learn to truly accept painful experiences in one's life. The finding also suggest that learning to disengage and to be less identified with unpleasant experiences does not necessarily mean that negative thoughts and emotions are approached with openness and curiosity (Neff, 2003). This finding brings us to a more general discussion regarding the assessment of mindfulness.

When looking at the items of the different scales, it can be noticed that most scales measure *mindlessness*, rather than mindfulness. For instance, items related to being aware of daily experiences and activities (MAAS) actually measure functioning on automatic pilot (Brown & Ryan, 2003). Similarly, an attitude of acceptance (KIMS) is measured by items related to self-criticism (Baer *et al.*, 2004) and disengaging from unpleasant experiences is assessed with SCS items related to over-identification and catastrophizing (Neff, 2003). Only the observing and attending scale (KIMS) and the mindfulness subscale (SCS) are positively worded. Also other more recently developed questionnaires tend to use negatively worded items to measure mindfulness (Cardaciotto *et al.*, 2008). More research is needed to clarify the use of positively and negatively formulated items to measure mindfulness and to demonstrate the validity of combining these items into one overall score. This research should explore the conceptual overlap and dissimilarity between acting with awareness versus automatic functioning, decentering versus over-identification, and acceptance versus judgment/self-criticism. Such conceptual research may also clarify whether it is meaningful to assess the distinct features of mindfulness in terms of attention regulation and acceptance independently of each other, as it can be questioned whether items assessing attention *without* the acceptance component measure mindfulness.

Correlation and regression analyses showed that an increase in mindfulness skills was related to improved psychological well-being. Such information is of great clinical importance, as the results suggest that the beneficial effects of the intervention on psychological well-being are indeed associated with learning to be more mindful. Our study extends previous research on this topic, as we made clear distinctions between different aspects of mindfulness as well as between positive and negative affect. We found an intriguing pattern, suggesting that learning to regulation one's attention (in terms of being more aware of present-moment experiences and acting less automatically) was most important for experiencing positive emotions. In contrast, learning to hold a different attitude towards experiences (in terms of having less judgments regarding one's emotions and thoughts and being more open and curious towards painful feelings) seemed to be more important for alleviating negative emotions. We have no good explanation for the non-significant association of improved awareness of daily activities with decreased negative affect and the non-significant

relationship between having less judgment regarding one's experiences and an increased positive affect. One remarkable notion is that our results do not show that negatively formulated scales of mindlessness are more strongly related to negative affect and that positively formulated scales are more strongly related to positive affect. As this study is the first attempt to explore the relationships among changes in distinct aspects of mindfulness and changes in positive and negative affect over the course of a mindfulness-based intervention, future research is needed to confirm our findings.

When discussing our results, a number of study shortcomings should be considered. *First*, as this is a naturalistic study, there was no comparison or control group. This limits the ability to infer causation of any changes to the intervention, as the observed effects may also be due to other factors such as time and non-specific factors such as a supportive group and therapeutic relationship. However, it is reassuring to see that some of our pre- and post-intervention mindfulness scores are similar to those found in a randomized controlled trial that demonstrated a greater increase in the intervention group compared to the control group (Nyklícek & Kuijpers, 2008). This suggests that the participants' improvements in mindfulness in the present study are greater than can be expected by natural improvement or non-specific factors alone. *Second*, the present study focused on the immediate changes during the 8-week intervention, therefore, no conclusions can be drawn about the long-term effects of a mindfulness-based intervention. Furthermore, as we assessed mindfulness on only two points in time, without intermediate assessments during the intervention, no conclusions can be drawn about whether certain mindfulness aspects are easier to learn than others. The assessment of mindfulness and psychological well-being at the same points in time also precludes drawing definite conclusions about causality, that is, whether more mindfulness induces a better well-being or whether a better well-being induces more mindfulness. *Third*, many individuals under study were highly educated, had signed in for the course themselves through the internet, without referral from a professional, and also paid for the training themselves. This might decrease the generalizibility of the findings to other samples. *Fourth*, as we included a heterogeneous sample from the general population in our study, some participants had pre-intervention affect scores that were in the normal, non-clinical range. As the results indicated that participants with a higher psychological well-being at pre-intervention were relatively less likely to improve, it might be that our results reflect an underestimation of the changes in positive and negative affect. *Fifth*, we used self-report questionnaires to measure affect and mindfulness. Brown and Ryan (2003) found a moderate association of self-reported mindfulness with social desirability, but also demonstrated that the association of mindfulness with well-being remained significant when taking social desirability into account. This result suggests that our findings can probably not be fully attributed to the effect of social desirability, yet it might be fruitful to include other types of measurements of mindfulness in future research (such as performance tasks of attention).

In conclusion, our findings demonstrate that participation in a mindfulness-based intervention is associated with improved psychological well-being and increased mindfulness skills and that changes in mindfulness are related to improved well-being. We have also seen that the examination of distinct aspects of mindfulness, rather than a single overall indication, is meaningful in understanding this complex construct and its role in psychological functioning. In order to further increase our understanding of the effects of mindfulness-based interventions, future research is needed that includes a broader range of outcomes (e.g. wisdom, meaning in life, and compassion), possible

mediators of change (e.g. emotion regulation) and moderators (e.g. demographic and clinical characteristics) (Allen *et al.*, 2006; Bishop *et al.*, 2004; Shapiro *et al.*, 2006). Evaluation of treatment integrity and compliance should also be taken into account. Such future research may shed more light on the question *whether* and *how* mindfulness is related to an improved functioning and if mindfulness-based interventions are differentially effective for different populations.

## Acknowledgements

The authors would like to thank Ton van Berkel for helping with the data collection.

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*Received 6 October 2008; revised version received 2 February 2009*